

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

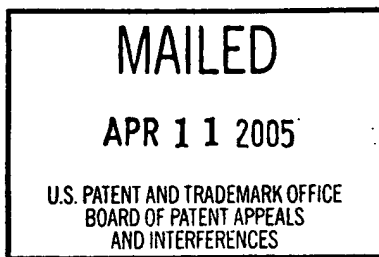
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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte Arvind Halliyal, Mark T. Ramsbey,  
Hidehiko Shiraiwa and Jean Y. Yang

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Appeal No. 2005-0953  
Application No. 10/023,548

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ON BRIEF

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Before KIMLIN, OWENS and KRATZ, Administrative Patent Judges.  
KIMLIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1, 3, 5-12 and 13. Claims 2-4 and 14-21 stand withdrawn from consideration.

Claim 1 is illustrative:

1. A process for fabrication of a semiconductor device including an ONO structure, comprising forming the ONO structure by:

providing a semiconductor substrate having a silicon surface;

forming a first oxide layer on the silicon surface;

depositing a silicon nitride layer on the first oxide layer; and

forming a top oxide layer on the silicon nitride layer,

wherein the first oxide layer is formed by an in-situ steam generation oxidation of the silicon surface and the top oxide layer is formed by an in-situ steam generation oxidation of a surface of the silicon nitride layer.

The examiner relies upon the following references as evidence of obviousness:

Okuyama

4,918,503

Apr. 17, 1990

Peter Van Zant, "A Practical Guide to Semiconductor Processing", Microchip Fabrication, 4<sup>th</sup> ed. McGraw-Hill: New York (2000), pp. 172-173, 179-182, 480-487. (Van Zant).

Appellants' claimed invention is directed to a process for fabricating a semiconductor device comprising an oxide-nitrate-oxide (ONO) structure. The method entails forming a first oxide layer on the silicon surface of a semiconductor substrate, depositing a silicon nitride layer on the first oxide layer, and forming a top oxide on the silicon nitride layer. Both the first and top oxide layers are formed by in-situ steam generation oxidation.

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Appealed claims 1, 5-12 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Okuyama in view of Van Zant.

Appellants submit at page 4 of brief that "[c]laims 1 and 5-13 stand or fall together" (last paragraph). Accordingly, all of the appealed claims stand or fall together with claim 1 and we will limit or consideration of appellants' appeal accordingly.

We have thoroughly reviewed each of appellants' arguments for patentability. However, we are in complete agreement with the examiner's reasoned analysis and application of the prior art, as well as his cogent disposition of the arguments raised by appellants. Accordingly, we will sustain the examiner's rejections for the reasons set forth in the answer, which we incorporate herein, and we add the following for emphasis only.

There is no dispute that Okuyama discloses the presently claimed steps of forming a semiconductor device having an ONO structure by forming a first oxide layer on a silicon surface, depositing a silicon nitride layer on the first oxide layer, and forming a top oxide layer on a silicon nitride layer. As recognized by the examiner, the reference "does not indicate the method by which the steam oxidation is performed" (page 6 of

answer, fourth paragraph). However, Van Zant teaches that the claimed in-situ steam generation oxidation is the preferred method for performing steam oxidation for the cleanliness and control of the process (see pages 172-173). Consequently, since Okuyama expressly teaches that the first and top oxide layers can be formed in a steam atmosphere (column 2, lines 35 et seq.), we fully concur with the examiner that one of ordinary skill in the art would have found it obvious to employ in-situ steam generation oxidation for forming the first and top oxide layers in Okuyama.

Appellants contend that the claimed process, unlike the Okuyama process, requires that "the first oxide layer is formed on the silicon surface of a semiconductor substrate; i.e., the first oxide is formed on the substrate" (page 6 of brief, second paragraph). However, as emphasized by the examiner, appellants' argument is not germane to the claimed subject matter. Claim 1 does not recite that the first oxide is formed on the substrate, but only on a silicon surface associated with the substrate. As explained by the examiner, Okuyama discloses that layers 45 and 46 may be formed by implantation into the silicon surface of the substrate, as shown in figures 5A and 5B (see also the paragraph

bridging columns 6 and 7). Appellants have not refuted the examiner's reasonable analysis that since "impurities are merely implanted into the surface of the silicon substrate which is then oxidized . . . Okuyama expressly discloses that the silicon surface is oxidized" (page 14 of answer, second paragraph). We note that appellants' brief does not address this analysis, and a reply brief was not submitted.

Appellants also maintain that Okuyama teaches oxidation at 900°C in oxygen for oxide layer 14 and oxidation at 950°C in steam for oxide layer 16 and therefore, "the reference teaches two different oxidations on the two different materials, and does not teach that these could be changed" (page 10 of brief, last paragraph). We strongly disagree with appellants' narrow interpretation of Okuyama. Simply put, we agree with the examiner that Okuyama clearly teaches that both oxidation procedures can be preformed in a steam atmosphere. To wit, the reference discloses that "[t]he first and second silicon oxide films may be provided for heat treatments under an atmosphere for oxidation, such as oxygen atmosphere or steam atmosphere" (column 2, lines 35 et seq., emphasis added).


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As a final point, we note that appellants base no argument upon objective evidence of nonobviousness such as unexpected results, which would serve to rebut the prima facie case of obviousness established by the examiner.

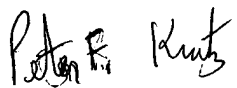
In conclusion, based on the foregoing, the examiner's decision rejecting the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv).

AFFIRMED

  
EDWARD C. KIMLIN )  
Administrative Patent Judge )

  
TERRY J. OWENS )  
Administrative Patent Judge )

  
PETER F. KRATZ )  
Administrative Patent Judge )

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